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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellant: Yoshitada OSHIDA et al.

Serial No.: 09/678,652

Filed: 04 October 2000

Title: A METHOD OF INSPECTING A DNA CHIP AND AN APPARATUS THEREOF

Art Unit: 1634

Examiner: Bradley L. SISSON

Conf No.: 7028

CORRECTED APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

25 July 2006

Sir:

Appellant herein files a Corrected Appeal Brief within two (2) months of the 25 May 2006 Notice of Non-Compliant Appeal Brief, as follows:

The following items are provided with the headings and the order required.

1. REAL PARTY IN INTEREST

A statement identifying the real party in interest, if the party named in the caption of the brief is not the real party in interest, is given as follows: Hitachi, Ltd. is the real party in interest, by virtue of an Assignment of all rights in the subject matter of the present invention from the inventors, recorded in the USPTO on 29 January 2001 at real/frame 011475/0400.

2. RELATED APPEALS AND INTERFERENCES

A statement identifying by application, patent, appeal or interference number all other prior and pending appeals, interferences or judicial proceedings known to appellant, the appellant's legal representative, or assignee which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal, is given as follows: None.

3. STATUS OF CLAIMS

A statement of the status of all the claims in the proceeding (e.g., rejected, allowed or confirmed, withdrawn, objected to or cancelled), and an identification of those claims that are appealed, are detailed as follows:

Claims 1-49 have been advanced during the prosecution history of the application.

Claims 12-17 and 30-35 represent non-elected claims which have been cancelled without prejudice after being subject to a Restriction or Election Requirement, leaving claims 1-11, 18-29 and 36-49 pending as of the date of the filing of this Appeal Brief.

Claims 1-11, 18-29 and 36-49 stand finally rejected under 35 USC '103.

Claims 1-11, 18-29 and 36-49 have been twice rejected, and accordingly, the jurisdictional prerequisite for appeal from the decision of the Examiner to the Board of Patent Appeals and Interferences has been met. In view of the requirements that an Appeal in an application or reexamination preceding must identify, when the

appeal is taken, all rejected claim or claims which are to be appealed and proposed to be contested, Appellant respectfully submits that all presently rejected claims (including at least claims 1-11, 18-29 and 36-49) are appealed.

4. STATUS OF AMENDMENTS

A statement of the status of any amendments filed subsequent to Final Rejection, is detailed as follows:

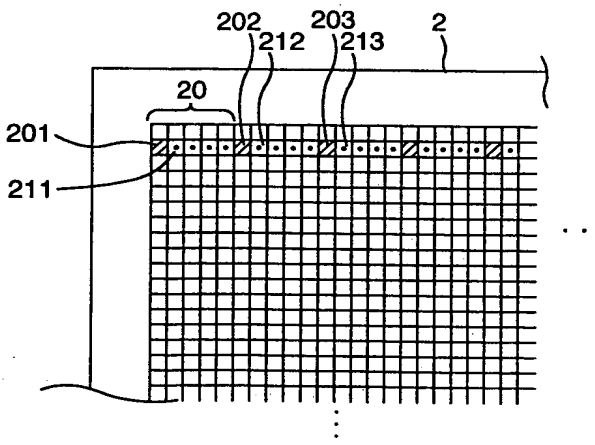
Appellant's 12 September 2005 "Amendment" has been acted upon by the Examiner and treated in a 23 September 2005 "Advisory Action", with the following effect: The Amendment is not deemed to place the application in condition for allowance, and the proposed amendments to the claims and/or specification will not be entered, the final rejection standing because: the Examiner is of the opinion that the proposed amendments raise new issues that would require further consideration and/or search; the proposed amendments are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal. Attention is also directed to additional Examiner comments detailed within the continuation sheet of the Advisory Action.

5. SUMMARY OF CLAIMED SUBJECT MATTER

A concise explanation of the subject matter defined in each of the independent claims involved in the appeal, which shall refer to the specification by page and line number, and to the drawing(s), if any, by reference characters, is given as follows. Further, for each independent claim involved in the appeal and for each dependent claim separately argued ahead, every means plus function and step plus function as permitted by 35 U.S.C. 112, sixth paragraph, is identified and the structure, materials, or acts described in the specification as corresponding to each claimed function is set forth with reference to the specification by page and line number and to the drawing(s), if any, by reference characters as follows.

Appellant's disclosed and claimed invention is directed to improved arrangements for inspecting a coupled state of hybridized target DNA on a DNA chip. Appellant's FIG. 2 (reproduced herewith) illustrates a partial plan view of Appellant's example DNA chip 2 having an array of cells (represented by the small squares). In order to inspect the overall state of the DNA chip 2, each of the cells is required to be individually inspected to see if target DNA is hybridized therein.

FIG. 2



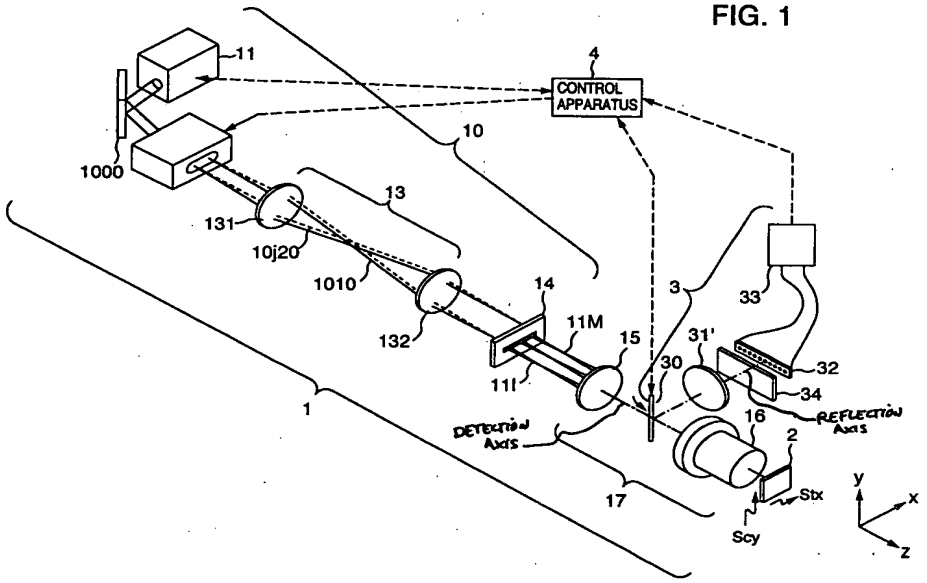
Before Appellant's invention, Appellant found that prior disadvantaged arrangements for inspecting provided unacceptable inspection speeds, noise ratios and/or complexities. For example, a disadvantaged arrangement using a scanning arrangement (*e.g.*, galvanometric or rotating mirror) to scan a **single** excitation spot across the area (i.e., the cells) of a DNA chip's array, was found (by Appellant) to suffer a time penalty because inspection of probe cells of the array was (in essence) being conducted **sequentially**. Likewise, a disadvantaged arrangement using multiple pixels (*i.e.*, a sub-array) of a photomultiplier tube and/or CCD detector to receive reflections from each probe cell was found (by Appellant) to suffer unacceptable inspection speeds, noise ratios **and** complexities.

More particularly, since any light emitted from a given probe cell is spread across (*i.e.*, detected by) multiple pixels, the light is shared by multiple detectors and thus is **diluted**. Since each pixel only received a portion of the emitted light, such is more susceptible to noise interference (*e.g.*, scattered light, remnants of the excitation light). Further, the data from the multiple pixels (for any given probe cell) would then have to be analyzed/processed (e.g., added) so as to come up with a single result value for the given probe cell. In short, such multiple pixel use/analysis was found (by Appellant) to represent unnecessary complexity and light dilution, leading to time penalties (due to processing) and/or detection errors (via noise).

In order to avoid the above problems, Appellant came up with a unique and novel combination invention using **simultaneous scanning and detection** of multiple probe cells at the same time **(to improve speeds)**, and **using one-to-one correspondence between probe cells, excitation light spots, and sensors (to**

eliminate complexities). More particularly, Appellant's FIG. 1 (reproduced herewith) illustrates a simplified perspective view of one example embodiment of Appellant's invention.

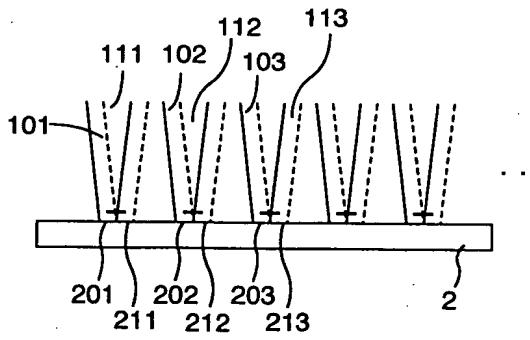
FIG. 1



Regarding details, a light source 11 is shown at one end, providing light through an optical system 10 in a manner such that plural excitation light spots 11 ...11M are simultaneously applied to the DNA chip 2 in a direction of a detection axis (note that the plural excitation light beams are not illustrated along the detection axis for simplicity and clearness of the FIG.). Assume, for purposes of discussion, that ten (10) plural excitation light spots 11 strike ten (10) corresponding DNA chip cells, causing fluorescent material added to targets hybridized at the ten (10) cell sites to become excited and emit fluorescent light. The emitted fluorescent light travels backwards along the detection axis only to be selectively deflected by the beam splitter mirror 30 along the reflection axis, to eventually strike ten (10) corresponding

fibers 32 feeding detectors 33 (e.g., a photomultiplier tube). (Note that the fluorescent light beams are not illustrated along the detection or reflection axes for simplicity and clearness of the FIG.) Appellant's FIG. 3 (reproduced herewith) is a cross-sectional view of Appellants DNA chip 2, and more clearly shows a representation of the multiple excitation excitation light and emited fluorescent light with respect to the DNA chip 2.

FIG. 3



As an advantage, by simultaneously scanning and detecting, for example, 10 probe cells, there can be a 10-fold increase in speed. **One important feature of Appellant's invention is that multiple individual excitation light spots are applied, and multiple reflection lights are detected**. By using one-to-one correspondence between probe cells, excitation light spots, cells and sensors, each probe cell is treated with a single excitation light spot and resultant emitted light is treated with a single sensor. Hence, light is concentrated to a single sensor (lessening noise sensitivity), and a probe cell detection value is immediately obtained (without addition or other processing) from the single sensor (again improving speed).

Each of Applicant's independent claims is now reiterated on a separate page, together with example (non-limiting) references to Applicant's specification by page and line number, and to the drawings by reference characters.

1. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS. 1-2) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip (2) with a corresponding plurality of multi-spot excitation lights (11L-11M; FIG. 1) through an objective lens (15, 16; FIG. 1) so as to generate fluorescent lights (page 56; lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating said generated fluorescent lights from said plurality of multi-spot excitation lights into separate fluorescent lights along separate optical paths (fiber system 32; FIGS. 1 and 20; page 61, lines 10+; page 77, lines 13+); and

detecting said separate fluorescent lights simultaneously (page 81; lines 24+) with a plurality of sensors (photomultiplier tube 23;FIG. 20; page 77, lines 13+), with each sensor corresponding to each of said DNA probe cells irradiated (page 58; lines 3-5), so as to catalog positions and intensities of detected fluorescent lights (page 82, lines 16+) which are representative of a coupled state of the hybridized target DNA on said DNA chip."

18. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS. 1-2) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), comprising:

branching a laser beam so as to form eight or more beams (page 110, lines 13+), said laser beam being emitted from at least one laser light-source (page 84, lines 9+);

after sample exposure/coupling, simultaneously irradiating a corresponding eight or more of the DNA probe cells (small squares; FIG. 2) on an inspection plane of a DNA chip (2) with said eight or more beams (11), respectively, so as to generate fluorescent lights (page 56; lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating fluorescent lights emitted from irradiated ones of the DNA probe cells of said DNA chip, from reflected lights of said eight or more beams (fiber system 32; FIGS. 1 and 20; page 61, lines 10+; page 77, lines 13+);

detecting said separated fluorescent lights simultaneously (page 81, lines 24+) with a plurality of sensors (photomultiplier tube 23; FIG. 20; page 77, lines 13+), each sensor corresponding to each irradiated said DNA probe cell, respectively (page 58, lines 3-5); and

getting information from said DNA chip by cataloging position and intensities of detected fluorescent lights (page 82, lines 16+) which are representative of a coupled state of the hybridized target DNA on said DNA chip.

19. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS. 1-2) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), comprising:

branching a laser beam into a plurality of beams having substantially the same intensity, said laser beam being emitted from at least one laser light-source (page 84, lines 9+);

after sample exposure/coupling, simultaneously projecting said plurality of beams onto a corresponding plurality of the DNA probe cells (2) on an inspection plane of the DNA chip through a projection optical unit (FIG. 4), so as to generate fluorescent lights (page 56, lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

detecting, through an imaging optical unit, images of fluorescent lights emitted from irradiated ones of the DNA probe cells of said DNA chip simultaneously (page 81, lines 24+) with a plurality of sensors (page 61, lines 10+; page 77, lines 13+), each sensor corresponding to each irradiated said DNA probe cell, respectively (page 58, lines 3-5); and

getting information from said DNA chip by cataloging position and intensities of detected fluorescent lights (page 82, lines 16+) concerning a coupled state of the hybridized target DNA on said DNA chip.

22. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS. 1-2) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip (2) with a corresponding plurality of multi-spot excitation lights (11; FIG. 1) so as to emit fluorescent lights (page 56, lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating said fluorescent lights emitted from ones of the DNA probe cells of said DNA chip, from said plurality of multi-spot excitation lights (fiber system 32; FIGS. 1 and 20; page 61, lines 10+; page 77, lines 13+);

detecting images of said fluorescent lights simultaneously (page 81, lines 24+) by use of a plurality of light detecting devices (photomultiplier tube 23; FIG. 20; page 77, lines 13+) capable of executing a photon counting (page 156, lines 23+), each sensor corresponding to each irradiated said DNA probe cell, respectively (page 58, lines 3-5);

photon-counting (page 156, lines 23+), individually, each photon signal obtained from said respective light detecting devices;

storing, individually, data of photon-counted numbers Npm detected by said respective light detecting devices (page 166, lines11-17);

changing positions of said plurality of multi-spot excitation lights and a position of said DNA chip relatively, so as to store data of said photon-counted numbers from said respective light detecting devices (page 167, lines 2+);

collecting stored data on said photon-counted numbers over desired locations on said DNA chip (page 166, lines11-17);

constructing a fluorescent light image from said collected data; and

deriving information for said DNA chip from said collected data, by cataloging positions and intensities of detected fluorescent lights (page 82, lines 16+) which are representative of a coupled state of the hybridized target DNA on said DNA chip.

23. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS. 1-2) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip (2) with a sheet-shaped excitation light (page 171, lines 11+) so as to emit fluorescent lights (page 56, lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating said fluorescent lights emitted from ones of the DNA probe cells, from said sheet-shaped excitation lights (page 171, lines 11+);

detecting images of said fluorescent lights simultaneously (page 171, line 14) by use of a plurality of light detecting devices capable of executing a photon counting, each sensor corresponding to each irradiated said DNA probe cell, respectively;

photon-counting, individually, each photon signal obtained from said respective light detecting devices (page 167, lines 2+);

storing, individually, data of photon-counted numbers Npm detected by said respective light detecting devices;

changing positions (page 167, lines 2+) of irradiation areas and a position of said DNA chip relatively, so as to store in sequence data of said photon-counted

numbers from said respective light detecting devices; collecting stored data on said photon-counted numbers over desired locations on said DNA chip;

constructing a fluorescent light image from said collected data, and deriving information for said DNA chip from said collected data, by cataloging positions and intensities of detected fluorescent lights (page 82, lines 16+) which are representative of a coupled state of the hybridized target DNA on said DNA chip.

28. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS. 1-2) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), by detecting fluorescent lights (page 56, lines 7-16) generated from a fluorescent material on a DNA sample, comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip (2) with a corresponding plurality of multi-spot excitation lights (11) or a sheet-shaped excitation light (page 171, lines 11-12) so as to generate fluorescent lights (page 56, lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells, separating said fluorescent lights from said plurality of multi-spot excitation lights (fiber system 32; FIGS. 1 and 20; page 61, lines 10+; page 77, lines 13+) irradiated onto said DNA sample, said multi-spot excitation lights including M microscopic spots, where M is an integer;

detecting fluorescent light images from said fluorescent lights emitted from said DNA chip with the use of a plurality of M light detecting devices in an average pixel detecting time of (300 μsec/M) or less (page 171, lines 20-22), each light detecting device corresponding to each irradiated said DNA probe cell, respectively;

storing, individually, signals obtained from said respective light detecting devices:

changing, relatively, positions of said multi-spot excitation lights or said sheet-shaped excitation light and a position of said DNA chip so as to store said signals in sequence (page 172, lines 22-25);

collecting said stored signals over desired locations on said DNA chip;

constructing a fluorescent light image from said collected and stored signals; and

deriving information on said DNA chip from said collected data, by cataloging positions and intensities of detected fluorescent lights (page 82, lines 16+) which are representative of a coupled state of the hybridized target DNA on said DNA chip.

29. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS. 1-2) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), by detecting fluorescent lights generated from a fluorescent material on a DNA sample, comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip (2) with a corresponding plurality of multi-spot excitation lights (11) or a sheet-shaped excitation light (page 172, lines 8-9) so as to generate fluorescent lights (page 56, lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells, separating said fluorescent lights from said plurality of multi-spot excitation lights irradiated onto said DNA sample (fiber system 32; FIGS. 1 and 20; page 61, lines 10+; page 77, lines 13+), said multi-spot excitation lights including M microscopic spots having a diameter or focus-achieving width which is smaller than 3 μm and larger than 0.3 μm, said sheet-shaped excitation lights having a width that is smaller than 3 μm and larger than 0.3 μm (page 172, lines 11-15), where M is the number of microscopic spots;

detecting fluorescent light images emitted from said DNA chip simultaneously (page 81, lines 24+) with use of a plurality of light detecting devices (photomultiplier tube 23; FIG. 20; page 77, lines 13+) each sensor corresponding to each irradiated said DNA probe cell, respectively (page 58, lines 3-5);

storing, individually, signals obtained from said respective light detecting devices; changing, relatively, positions of said multi-spot excitation lights or said sheet-shaped excitation light and a position of said DNA chip so as to store said signals in sequence (page 172, lines 22+);

collecting said stored signals over desired locations on said DNA chip; constructing a fluorescent light image from said collected signals; and

deriving information for said DNA chip from said collected data, by cataloging positions and intensities of detected fluorescent lights (page 82, lines 16+) which are representative of a coupled state of the hybridized target DNA on said DNA chip.

48. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS. 1-2) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), comprising:

after sample exposure/coupling, simultaneously irradiating plural DNA probe cells out of said plurality of DNA probe cells of said DNA chip (2) with a corresponding plurality of multi-spot excitation lights (11) under a condition that each spot of said multi-spot excitation lights corresponds to a DNA probe cell through an objective lens (page 58, lines 3-5) so as to generate fluorescent lights (page 56, lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plural DNA probe cells;

separating said generated fluorescent lights from said plurality of multi-spot excitation lights into separate fluorescent lights along separate optical paths (fiber system 32; FIGS. 1 and 20; page 61, lines 10+; page 77, lines 13+); and

detecting said separate fluorescent lights simultaneously (page 81, lines 24+) with a plurality of sensors (photomultiplier tube 23; FIG. 20; page 77, lines 13+), with each sensor corresponding to each of said DNA probe cells irradiated (page 58, lines 3-5), so as to catalog positions and intensities of detected fluorescent lights (page 82, lines 16+) which are representative of a coupled state of the hybridized target DNA on said DNA chip.

49. A method of inspecting a coupled state of hybridized target DNA on a DNA chip (2; FIGS) that includes a plurality of DNA probe cells (small squares; FIG. 2) having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array (see FIG. 2, for example), comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip (2) with a corresponding plurality of multi-spot excitation lights (11) under a condition that each spot of the multi-spot excitation lights corresponds to one DNA probe cell through an objective lens (15, 16; FIG. 1) so as to generate fluorescent lights (page 56, lines 7-16) from any fluorescently labeled (page 71, lines 11+) target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating said generated fluorescent lights from said plurality of multi-spot excitation lights into separate fluorescent lights along separate optical paths (fiber system 32; FIGS. 1 and 20; page 61, lines 10+; page 77, lines 13+);

detecting said separate fluorescent lights simultaneously (page 81, lines 24+) with a corresponding plurality of sensors (photomulitplier tube 23; FIG. 20; page 77, lines 13+) under a condition that each separate fluorescent light corresponds to one sensor (page 58, lines 3-5), so as to catalog positions and intensities of detected fluorescent lights (page 82, lines 16+) which are representative of a coupled state of the hybridized target DNA on said DNA chip.

Further detailed discussions regarding Appellant's claimed invention can be found in Appellant's specification, beginning at page 54.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A concise statement of each ground of rejection presented for review, is detailed as follows:

i. Whether claims 1-11, 18-29 and 36-49 are unpatentable under 35 USC '103, as having been obvious from Pinkel et al. (U.S. Patent 5,830,645) in view of Stern (U.S. Patent 5,981,956), Rosenberg (U.S. Patent 4,538,613) and Rava et al. (U.S. Patent 5,874,219)?

7. ARGUMENT

The contentions of the Appellant with respect to each ground of rejection presented for review in the foregoing section, and the basis therefor, with citations of statutes, rejulations, authorities, and parts of the record relied on, are provided as follows, with each issue being treated under a separate heading and having a sub-paragraph number corresponding to the sub-paragraph number in the preceding section:

i. Claims 1-11, 18-29 and 36-49 ARE patentable under 35 USC '103, as having been obvious from Pinkel et al. (U.S. Patent 5,830,645) in view of Stern (U.S. Patent 5,981,956), Rosenberg (U.S. Patent 4,538,613) and Rava et al. (U.S. Patent 5,874,219).

For each rejection under 35 USC '103 Appellant's argument specifies the errors in the rejection and, if appropriate, the specific limitations in the rejected claims which are not described in the prior art relied on in the rejection, and explains

how such limitations render the claimed subject matter unobvious over the prior art. Further, if the rejection is based upon a combination of references, Appellant's argument explains why the references, taken as a whole, do not suggest the claimed subject matter, and includes, as may be appropriate, an explanation of why features disclosed in one reference may not properly be combined with features disclosed in another reference. Appellant acknowledges that a general argument that all the limitations are not described in a single reference does not satisfy the requirements of this paragraph.

Independent claims 1, 18, 22, 28, 29 (and claims 2-11, 18, 24-27, 36-39, 42-43 and 45-46 dependent therefrom):

The detailed description of Appellant's invention is as was provided above. In terms of distinguishing claim language, independent claim 1, for example, recites (in part), "simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights through an objective lens so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells; ...and detecting said separate fluorescent lights simultaneously with a plurality of sensors, with each sensor corresponding to each of said DNA probe cells irradiated..." The other ones of independent claims contain similar or analogous features/limitations. Independent claim 28 and 29 (and claims dependent therefrom) contains the features/limitations of a "sheet-shaped" excitation light in addition to the multi-spot excitation lights.

In order to properly support a §103 obviousness-type rejection, the references not only must suggest the claimed features, but also must contain the motivation for modifying the art to arrive at an approximation of the claimed features. However, the cited art does not adequately support a §103 obviousness-type rejection.

That is, Pinkel *et al.* uses a standard fluorescence microscope arrangement and a CCD camera to acquire color images. Pinkel *et al.*'s sample is not a DNA probe, i.e., it is a microscope with a camera. Accordingly, in Pinkel *et al.*, there is no disclosure that a plurality of DNA probe cells are irradiated simultaneously with multi-spot exciting lights, and that the generated and separated fluorescent lights are simultaneously detected with a plurality of sensors each corresponding to each of the DNA probe cells irradiated.

Regarding Stern, Office Action comment cite Stern's column 10, lines 21-28, and quote Stern's text of "simultaneous interrogation of a single array with multiple target sequence" and "directing the fluorescent signal to detectors (applicant's sensor") such that the signal is detected, measured and recorded." A couple of points are critical to note in rebuttal. **First**, Stern teaches scanning of a **single** spot. Thus, Stern teaches the opposite of Appellant's invention, *i.e.*, teaches an arrangement having a scanning device which rapidly sweeps **a single activation beam or spot** across a surface of a substrate (**as opposed to a plurality of spots**).

Second, in talking about "simultaneous interrogation of a single array", Stern's column 10 text **isn't talking about using a plurality of spots for simultaneous interrogation**, but **instead is talking about using multiple dichroic mirrors to branch-off different wavelength portions of a returned SINGLE-**

SPOT excitation light to separate detectors. In short, the Stern apparatus is utilizing an entirely different and non-analogous approach of utilizing dichroic mirrors to parse out different wavelength portions of a single beam.

The reference to Rosenberg is non-analogous art, i.e., Rosenberg relates to a **surgery tool** sending a laser beam through optical fibers. In no way does it concern or relate to inspection of a DNA probe. In short, given that it is a surgical tool, there is no disclosure that a plurality of DNA probe cells are irradiated simultaneously with multi-spot exciting lights, and that the fluorescent lights are detected with a plurality of sensors, each corresponding to each spot of the multi-spot exciting lights.

In recognizing that the combination of the first three applied references failed, the Examiner has most recently applied Rava *et al.* Rava *et al.* relates to arrangements for concurrently processing multiple biological chip assays, where a biological chip plate contains a plurality of test wells which each have a biological chip having a molecular probe array. Rava *et al.* teaches use of a monochromatic or polychromatic light source in the form of **a line of light** (column 6, line 43) or scanning (of a **single spot**) using galvometric or polyhedral mirrors (column 6, lines 54-55). For detection, Rava *et al.*, for example, teaches use of a photomultiplier tube (column 5, lines 30-31, for example), or a CCD camera (column 6, lines 19-20, for example).

What Rava *et al.* (like Pinkel *et al.*, Stern and Rosenberg) does not teach, is simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights, or detecting separate fluorescent lights (which are returned along separate channels) simultaneously with

a plurality of sensors, with each sensor corresponding to each of said DNA probe cells irradiated. More particularly, Rava *et al.*'s CCD arrangements, for example, uses 6 lines (column 6, lines 33-34) of an image to detect each feature (*e.g.*, a probe). Nowhere does Rava *et al.* talk about using multi-spots, or attributing a detector to returned emitted light from a given excitation spot.

To conclude, given that none of the applied references (taken alone or in combination) disclosed any arrangement even closely resembling Appellant's "simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights through an objective lens so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells; ...and detecting said separate fluorescent lights simultaneously with a plurality of sensors, with each sensor corresponding to each of said DNA probe cells irradiated...", it is respectfully submitted that no combination of such references would have disclosed or suggested Appellant's invention.

Further, since Stern relates to scanning with a single spot, such appears at least somewhat incompatible with Pinkel *et al.* and Rava *et al.* which appear mainly to image (e.g., via a camera). Still further, it is respectfully noted that Rosenberg does not even relate to an inspection of DNA probe, i.e., it relates to a surgical tool. Given that a significant number of seemingly incompatible/irrelevant references were used, it is respectfully submitted that this continued rejection of Appellant's invention (based upon more-and-more references over time) smacks of an improper hindsight reconstruction approach to rejection.

As mentioned previously, in order to properly support a §103 obviousness-type rejection, the references not only must suggest the claimed features, but also must contain the motivation for modifying the art to arrive at an approximation of the claimed features. It is respectfully submitted that there would have been no suggestion or motivation provided by the four applied references to combine Rosenberg's surgical tool teachings with any of the other three references. Further, given that one(s) of the references is directed to detecting with a detector while other one(s) of the references is directed to detecting with a camera image, again, it is respectfully submitted that there would have been no suggestion or motivation to combine. Finally, given that none of the applied four references teach **simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights**, it is respectfully submitted that, even if combined, no combination of the applied four references would have resulted in, or suggested, Appellant's claimed invention.

Regarding independent claim 18 (and any claims dependent therefrom), such claim specifically recites that there are eight (8) excitation lights. Given that none of the applied four references teach **simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights**, it is respectfully submitted that none of such references teach exciting with eight (8) excitation lights. Thus, claim 18 (and any claims dependent therefrom) are even further distinguished from independent claim 1.

In addition to the foregoing, the following additional remarks from Appellant's foreign representative are also submitted in support of traversal of the rejection and patentability of Appellant's claims, e.g., independent claim 1.

None of the references of record disclose the following important features of the present invention:

1) a plurality of laser beams are simultaneously irradiated to a plurality of DNA probe cells, each of the laser beams corresponding to each of the DNA probe cells; and

2) fluorescent lights generated simultaneously from the plurality of DNA probe cells are separately detected for each of the plurality of DNA probe cells.

Pinkel *et al.*, at Col.12, lines 28-39, describes that a polychromatic beam splitter is used. In Pinkel *et al.*, correction of chromatic aberration is executed to prevent from the shifting of an image according to color. However, Pinkel *et al.* is very different from the art in which fluorescent lights generated simultaneously from the plurality of DNA probe cells are separately detected for each of the plurality of DNA probe cells. Further, in Pinkel *et al.*, there is no disclosure that a plurality of laser beams are simultaneously irradiated to a plurality of DNA probe cells, and each of the laser beans corresponds to each of the DNA probe cells.

In the portion of Stern recited in the Office Action, it is described that fluorescent lights which are obtained by irradiation of argon laser are divided into two components above 515 nm and below 515 nm. However, again, Stern is very different from the art in which fluorescent lights generated simultaneously from the plurality of DNA probe cells are separately detected for each of the plurality of DNA

probe cells. Further, in Stern, there is no disclosure that a plurality of laser beams are simultaneously irradiated to a plurality of DNA probe cells.

In Rosenberg, at Col. 19, it is described that multiple beams are irradiated to a target along with a reference light axis. However, this is executed to measure interference of a light having a particular wavelength (see, *e.g.*, Doppler analysis in Col. 18, lines 53-58). It is again noted that the art of Rosenberg is very different from the art in which a plurality of laser beams are simultaneously irradiated to a plurality of DNA probe cells. In Rosenberg, there is no disclosure concerning the art that fluorescent lights generated simultaneously from the plurality of DNA probe cells are separately detected for each of the plurality of DNA probe cells.

In Rava *et al.*, at Col. 6, lines 40-57, it is described that a laser beam is irradiated to a target in a linear manner, and scanning is executed in a stripe manner. However, this is very different from the present invention, and from a plurality of laser beans that are simultaneously irradiated to a plurality of DNA probe cells.

As is clear from the above, the present invention is very different from the references, and accordingly, the present invention is patentable thereover.

As a result of all of the foregoing, it is respectfully submitted that the applied art (taken alone and in the Office Action combination) would not support a §103 obviousness-type rejection of Appellant's claims. Accordingly, reconsideration and reversal of such §103 rejection, and express written allowance of independent claim 1 (and claims dependent therefrom), are respectfully requested.

Independent claim 48:

The detailed description of Appellant's invention is as was provided above. In terms of distinguishing claim language, independent claim 48 recites "multi-spot" features/limitations which are recited somewhat differently from independent claim 1. More particularly, independent claim 48, for example, recites (in part), "simultaneously irradiating plural DNA probe cells out of said plurality of DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights under a condition that each spot of said multi-spot excitation lights **corresponds** to a DNA probe cell through an objective lens so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plural DNA probe cells; ...and detecting said separate fluorescent lights simultaneously with a plurality of sensors, with each sensor **corresponding** to each of said DNA probe cells irradiated...".

Given that independent claim 48's feature/limitations are similarly based (although alternatively worded) with those of independent claim 1, it is respectfully submitted that the above independent claim 1 arguments apply equally as well for independent claim 48. In short, given that none of the applied four references teach "simultaneously irradiating plural DNA probe cells out of said plurality of DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights under a condition that each spot of said multi-spot excitation lights **corresponds** to a DNA probe cell through an objective lens", it is respectfully submitted that, even if combined, no combination of the applied four references would have resulted in, or suggested, Appellant's claimed invention.

As a result of all of the foregoing, it is respectfully submitted that the applied art (taken alone and in the Office Action combination) would not support a §103 obviousness-type rejection of Appellant's claims. Accordingly, reconsideration and reversal of such §103 rejection, and express written allowance of independent claim 48, are respectfully requested.

Independent claim 49:

The detailed description of Appellant's invention is as was provided above. In terms of distinguishing claim language, independent claim 49 recites "multi-spot" features/limitations which are recited somewhat differently from independent claim 1. More particularly, independent claim 48, for example, recites (in part), "simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights under a condition that each spot of the multi-spot excitation lights **corresponds** to one DNA probe cell through an objective lens so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells; ...and detecting said separate fluorescent lights simultaneously with a corresponding plurality of sensors under a condition that each separate fluorescent light **corresponds** to one sensor...".

Given that independent claim 49's feature/limitations are similarly based (although alternatively worded) with those of independent claim 1, it is respectfully submitted that the above independent claim 1 arguments apply equally as well for independent claim 49. In short, given that none of the applied four references teach

"simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights under a condition that each spot of the multi-spot excitation lights **corresponds** to one DNA probe cell through an objective lens", it is respectfully submitted that, even if combined, no combination of the applied four references would have resulted in, or suggested, Appellant's claimed invention.

As a result of all of the foregoing, it is respectfully submitted that the applied art (taken alone and in the Office Action combination) would not support a §103 obviousness-type rejection of Appellant's claims. Accordingly, reconsideration and reversal of such §103 rejection, and express written allowance of independent claim 49, are respectfully requested.

Independent claim 19 (and claims 20-21 and 40-41 dependent therefrom):

The detailed description of Appellant's invention is as was provided above. In terms of distinguishing claim language, independent claim 19 recites (in part), "**branching a laser beam into a plurality of beams** having **substantially the same intensity**, said laser beam being emitted from at least one laser light-source; after sample exposure/coupling, **simultaneously projecting said plurality of beams onto a corresponding plurality of the DNA probe cells on an inspection plane of the DNA chip through a projection optical unit**, so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;...". In essence, the "branched" laser

beams are analogous to independent claim 1's "multi-spots", and again, the branched laser beams are applied to "a corresponding plurality of DNA probe cells". Further, there is the added feature that the branched laser beams are "substantially the same intensity".

Given that independent claim 19's feature/limitations are similarly based (although alternatively worded) with those of independent claim 1, it is respectfully submitted that the above independent claim 1 arguments apply equally as well for independent claim 19. In short, given that none of the applied four references teach "**branching a laser beam into a plurality of beams** having **substantially the same intensity**, said laser beam being emitted from at least one laser light-source; after sample exposure/coupling, **simultaneously projecting said plurality of beams onto a corresponding plurality of the DNA probe cells on an inspection plane of the DNA chip through a projection optical unit**,...", it is respectfully submitted that, even if combined, no combination of the applied four references would have resulted in, or suggested, Appellant's claimed invention.

As a result of all of the foregoing, it is respectfully submitted that the applied art (taken alone and in the Office Action combination) would not support a §103 obviousness-type rejection of Appellant's claims. Accordingly, reconsideration and reversal of such §103 rejection, and express written allowance of independent claim 19 (and claims 20-21 and 40-41 dependent therefrom), are respectfully requested.

Independent claim 23 (and claims 45 and 47 dependent therefrom):

The detailed description of Appellant's invention is as was provided above. In terms of distinguishing claim language, independent claim 23 recites (in part), "after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip **with a sheet-shaped excitation light** so as to emit fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells; separating said fluorescent lights emitted from ones of the DNA probe cells, from said sheet-shaped excitation lights; **detecting images of said fluorescent lights simultaneously by use of a plurality of light detecting devices** capable of executing a photon counting, **each sensor corresponding to each irradiated said DNA probe cell, respectively**;"

Independent claim 23 recites a "sheet-shaped" excitation light, while none of the four (4) applied references discloses such type of excitation light. Further, independent claim 23 (similar to independent claim 1), has detectors in a one-on-one correspondence with the irradiated ones of the DNA probe cells.

In short, given that none of the applied four references teach "simultaneously irradiating a plurality of the DNA probe cells of said DNA chip **with a sheet-shaped excitation light**" and "**detecting images of said fluorescent lights simultaneously by use of a plurality of light detecting devices** capable of executing a photon counting, **each sensor corresponding to each irradiated said DNA probe cell, respectively**;" it is respectfully submitted that, even if combined, no combination of the applied four references would have resulted in, or suggested, Appellant's claimed invention.

As a result of all of the foregoing, it is respectfully submitted that the applied art (taken alone and in the Office Action combination) would not support a §103 obviousness-type rejection of Appellant's claims. Accordingly, reconsideration and reversal of such §103 rejection, and express written allowance of independent claim 23 (and claims 44 and 47 dependent therefrom), are respectfully requested.

Conclusion:

Since the combination of the cited references in the manner required to achieve the claimed invention would not have been obvious to one of ordinary skill in the art at the time the claimed invention was made, it is respectfully requested that the 35 USC '103 rejection of claims 1-11, 18-29 and 36-49 be reversed.

APPENDICIES

For convenience of detachment without disturbing the integrity of a remainder of pages of this Appeal Brief, Appellant's Appendicies are provided on separate appendix sheets following a signature portion of this Appeal Brief.

DEPOSIT ACCOUNT AUTHORIZATION

To the extent necessary, Appellant petitions for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees and the fee for filing this Brief in support of the appeal, to Deposit Account No. 01-2135 (referencing case No. 500.39147X00) and please credit any excess fees to such deposit account.

DECISION RE ORAL HEARING DELAYED

Appellant will delay a final decision on oral argument until after review of the Examiner's Answer.

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

Paul J. Skwierawski
Registration No. 32,173

PJS/slk
Enclosures:
(2) copies of Appeal Brief
APPENDIX

8. CLAIMS APPENDIX

Note that the full text and/or status of all claims (including those not being appealed within this paper) are included to provide the convenience of a complete set of claims for easy review:

1. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights through an objective lens so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating said generated fluorescent lights from said plurality of multi-spot excitation lights into separate fluorescent lights along separate optical paths; and

detecting said separate fluorescent lights simultaneously with a plurality of sensors, with each sensor corresponding to each of said DNA probe cells irradiated, so as to catalog positions and intensities of detected fluorescent lights which are representative of a coupled state of the hybridized target DNA on said DNA chip.

2. The method as claimed in Claim 1, wherein said plurality of multi-spot excitation lights are arranged in a 1-dimensional or 2-dimensional configuration.

3. The method as claimed in Claim 1, comprising:

arranging said plurality of multi-spot excitation lights irradiated onto said DNA chip on a straight line with a spacing of kd with reference to a spot diameter d and an integer k; and

repeating an operation in sequence k times, said operation being an operation where, after said irradiation with said plurality of multi-spot excitation lights has been performed, said plurality of multi-spot excitation lights are displaced in substantially a direction of said straight line by substantially d and said irradiation is performed again; and thereby

executing said inspecting substantially in said straight line direction; and

displacing said DNA chip and said objective lens relatively at least in a direction substantially perpendicular to said straight line direction; and thereby

inspecting a desired 2-dimensional area on said DNA chip.

4. The method as claimed in Claim 1, comprising providing fluorescent light detection deflecting means within said separate optical paths so that said generated fluorescent lights are synchronized with displacement of said plurality of multi-spot excitation lights and come onto substantially the same location on light-receiving apertures.

5. The method as claimed in Claim 4, wherein said fluorescent light detection deflecting means includes a wavelength selection beam splitter for permitting said plurality of multi-spot excitation lights to pass therethrough and causing said generated fluorescent lights to be reflected.

6. The method as claimed in Claim 1, comprising providing a filter within a fluorescent light detecting optical path isolated from an excitation optical path, said filter permitting only said generated fluorescent lights to pass there-through while light-shielding said plurality of multi-spot excitation lights.

7. The method as claimed in Claim 1, comprising forming said plurality of multi-spot excitation lights by using a plurality of laser light-sources.

8. The method as claimed in Claim 7, wherein said plurality of multi-spot excitation lights are obtained by:

guiding, into optical fibers, lights emitted from said plurality of laser light-sources; and causing said lights to be emitted from light-emitting ends of said optical fibers, said light-emitting ends being aligned with M desired pitches.

9. The method as claimed in Claim 1, wherein said plurality of excitation lights include a plurality of different wavelengths, and the method comprising distinguishing ones of the DNA probe cells as different targets on said DNA chip,

where a plurality of fluorescent materials responsive to ones of the plurality of different wavelengths are used to distinguish a plurality of different targets.

10. The method as claimed in Claim 9, comprising:

performing simultaneous irradiation with said plurality of multi-spot excitation lights including said plurality of different wavelengths; and thereby

distinguishing said different targets on said DNA chip so as to simultaneously detect said different targets in accordance with said plurality of fluorescent materials.

11. The method as claimed in Claim 1, comprising:

directing a second light with an oblique incident angle on an inspection plane of said DNA chip;

detecting a reflection position at which said second light is reflected on said inspection plane; and

controlling a relative distance between said inspection plane and said objective lens in accordance with a result of detection of said reflection position.

12.-17. (Canceled)

18. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being

of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, comprising:

branching a laser beam so as to form eight or more beams, said laser beam being emitted from at least one laser light-source;

after sample exposure/coupling, simultaneously irradiating a corresponding eight or more of the DNA probe cells on an inspection plane of a DNA chip with said eight or more beams, respectively, so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating fluorescent lights emitted from irradiated ones of the DNA probe cells of said DNA chip, from reflected lights of said eight or more beams;

detecting said separated fluorescent lights simultaneously with a plurality of sensors, each sensor corresponding to each irradiated said DNA probe cell, respectively; and

getting information from said DNA chip by cataloging position and intensities of detected fluorescent lights which are representative of a coupled state of the hybridized target DNA on said DNA chip.

19. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, comprising:

branching a laser beam into a plurality of beams having substantially the same intensity, said laser beam being emitted from at least one laser light-source;

after sample exposure/coupling, simultaneously projecting said plurality of beams onto a corresponding plurality of the DNA probe cells on an inspection plane of the DNA chip through a projection optical unit, so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

detecting, through an imaging optical unit, images of fluorescent lights emitted from irradiated ones of the DNA probe cells of said DNA chip simultaneously with a plurality of sensors, each sensor corresponding to each irradiated said DNA probe cell, respectively; and

getting information from said DNA chip by cataloging position and intensities of detected fluorescent lights concerning a coupled state of the hybridized target DNA on said DNA chip.

20. The method as claimed in Claim 19, wherein said DNA chip is inspected by irradiating said DNA chip with said beams while displacing said DNA chip and said beams relatively in a 2-dimensional manner.

21. The method as claimed in Claim 19, wherein said DNA chip is irradiated with said beams arranged in 2-dimensions.

22. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights so as to emit fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating said fluorescent lights emitted from ones of the DNA probe cells of said DNA chip, from said plurality of multi-spot excitation lights:

detecting images of said fluorescent lights simultaneously by use of a plurality of light detecting devices capable of executing a photon counting, each sensor corresponding to each irradiated said DNA probe cell, respectively;

photon-counting, individually, each photon signal obtained from said respective light detecting devices;

storing, individually, data of photon-counted numbers Npm detected by said respective light detecting devices;

changing positions of said plurality of multi-spot excitation lights and a position of said DNA chip relatively, so as to store data of said photon-counted numbers from said respective light detecting devices;

collecting stored data on said photon-counted numbers over desired locations on said DNA chip;

constructing a fluorescent light image from said collected data; and

deriving information for said DNA chip from said collected data, by cataloging positions and intensities of detected fluorescent lights which are representative of a coupled state of the hybridized target DNA on said DNA chip.

23. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a sheet-shaped excitation light so as to emit fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating said fluorescent lights emitted from ones of the DNA probe cells, from said sheet-shaped excitation lights;

detecting images of said fluorescent lights simultaneously by use of a plurality of light detecting devices capable of executing a photon counting, each sensor corresponding to each irradiated said DNA probe cell, respectively;

photon-counting, individually, each photon signal obtained from said respective light detecting devices;

storing, individually, data of photon-counted numbers Npm detected by said respective light detecting devices;

changing positions of irradiation areas and a position of said DNA chip relatively, so as to store in sequence data of said photon-counted numbers from said respective light detecting devices; collecting stored data on said photon-counted numbers over desired locations on said DNA chip;

constructing a fluorescent light image from said collected data, and deriving information for said DNA chip from said collected data, by cataloging positions and intensities of detected fluorescent lights which are representative of a coupled state of the hybridized target DNA on said DNA chip.

24. The method as claimed in Claim 22, wherein said multi-spot excitation lights include 10 or more microscopic spots.

25. The method as claimed in Claim 24, wherein said multi-spot excitation lights include 50 or more microscopic spots.

26. The method as claimed in Claim 24, wherein said microscopic spots are arranged on a 1-dimensional straight line or a 2-dimensional array.

27. The method as claimed in Claim 22, wherein said multi-spot excitation lights are colored lights having 2 or more wavelengths.

28. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which

fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, by detecting fluorescent lights generated from a fluorescent material on a DNA sample, comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights or a sheet-shaped excitation light so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells, separating said fluorescent lights from said plurality of multi-spot excitation lights irradiated onto said DNA sample, said multi-spot excitation lights including M microscopic spots, where M is an integer;

detecting fluorescent light images from said fluorescent lights emitted from said DNA chip with the use of a plurality of M light detecting devices in an average pixel detecting time of (300 μsec/M) or less, each light detecting device corresponding to each irradiated said DNA probe cell, respectively;

storing, individually, signals obtained from said respective light detecting devices:

changing, relatively, positions of said multi-spot excitation lights or said sheet-shaped excitation light and a position of said DNA chip so as to store said signals in sequence;

collecting said stored signals over desired locations on said DNA chip;

constructing a fluorescent light image from said collected and stored signals; and

deriving information on said DNA chip from said collected data, by cataloging positions and intensities of detected fluorescent lights which are representative of a coupled state of the hybridized target DNA on said DNA chip.

29. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, by detecting fluorescent lights generated from a fluorescent material on a DNA sample, comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights or a sheet-shaped excitation light so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells, separating said fluorescent lights from said plurality of multi-spot excitation lights irradiated onto said DNA sample, said multi-spot excitation lights including M microscopic spots having a diameter or focus-achieving width which is smaller than 3 μm and larger than 0.3 μm, said sheet-shaped excitation lights having a width that is smaller than 3 μm and larger than 0.3 μm, where M is the number of microscopic spots;

detecting fluorescent light images emitted from said DNA chip simultaneously with use of a plurality of light detecting devices, each sensor corresponding to each irradiated said DNA probe cell, respectively;

storing, individually, signals obtained from said respective light detecting devices; changing, relatively, positions of said multi-spot excitation lights or said sheet-shaped excitation light and a position of said DNA chip so as to store said signals in sequence;

collecting said stored signals over desired locations on said DNA chip; constructing a fluorescent light image from said collected signals; and

deriving information for said DNA chip from said collected data, by cataloging positions and intensities of detected fluorescent lights which are representative of a coupled state of the hybridized target DNA on said DNA chip.

30.-35. (Canceled)

36. The method as claimed in Claim 1, wherein said plurality of the DNA probe cells of said DNA chip are simultaneously irradiated with the corresponding plurality of multi-spot excitation lights for a time Δt that is longer than a fluorescent light attenuation time.

37. The method as claimed in Claim 1, wherein each light of said multi-spot excitation lights having a spot diameter d that is smaller than the dimensional size D of a DNA probe cell that it irradiates.

38. The method as claimed in Claim 18, wherein said eight or more of the DNA probe cells are simultaneously irradiated with said eight or more beams, respectively, for a time Δt that is longer than a fluorescent light attenuation time.

39. The method as claimed in Claim 18, wherein each beam of said eight or more beams having a spot diameter d that is smaller than the dimensional size D of a DNA probe cell that it irradiates.

40. The method as claimed in Claim 19, wherein said plurality of beams are simultaneously projected for a time Δt that is longer than a fluorescent light attenuation time.

41. The method as claimed in Claim 19, wherein each beam having a spot diameter d that is smaller than the dimensional size D of a DNA probe cell that it irradiates.

42. The method as claimed in Claim 22, wherein the plurality of the DNA probe cells are irradiated for a time Δt that is longer than a fluorescent light attenuation time.

43. The method as claimed in Claim 22, wherein each light of said multi-spot excitation lights having a spot diameter d that is smaller than the dimensional size D of a DNA probe cell that it irradiates.

44. The method as claimed in Claim 23, wherein the plurality of the DNA probe cells are simultaneously irradiated for a time Δt that is longer than a fluorescent light attenuation time.

45. The method as claimed in Claim 28, wherein the plurality of the DNA probe cells excitation lights are simultaneously irradiated for a time Δt that is longer than a fluorescent light attenuation time.

46. The method as claimed in Claim 29, wherein the plurality of the DNA probe cells are simultaneously irradiated for a time Δt that is longer than a fluorescent light attenuation time.

47. The method as claimed in Claim 23, wherein said sheet-shaped excitation lights are colored lights having 2 or more wavelengths.

48. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, comprising:

after sample exposure/coupling, simultaneously irradiating plural DNA probe cells out of said plurality of DNA probe cells of said DNA chip with a corresponding

plurality of multi-spot excitation lights under a condition that each spot of said multi-spot excitation lights corresponds to a DNA probe cell through an objective lens so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plural DNA probe cells;

separating said generated fluorescent lights from said plurality of multi-spot excitation lights into separate fluorescent lights along separate optical paths; and

detecting said separate fluorescent lights simultaneously with a plurality of sensors, with each sensor corresponding to each of said DNA probe cells irradiated, so as to catalog positions and intensities of detected fluorescent lights which are representative of a coupled state of the hybridized target DNA on said DNA chip.

49. A method of inspecting a coupled state of hybridized target DNA on a DNA chip that includes a plurality of DNA probe cells having a DNA probe to which fluorescently labeled target DNA may hybridize, ones of the DNA probe cells being of a microscopic dimensional size D, where DNA probes are arranged on the DNA chip in a predetermined array, comprising:

after sample exposure/coupling, simultaneously irradiating a plurality of the DNA probe cells of said DNA chip with a corresponding plurality of multi-spot excitation lights under a condition that each spot of the multi-spot excitation lights corresponds to one DNA probe cell through an objective lens so as to generate fluorescent lights from any fluorescently labeled target DNA hybridized to ones of the DNA probes of the plurality of DNA probe cells;

separating said generated fluorescent lights from said plurality of multi-spot excitation lights into separate fluorescent lights along separate optical paths;

detecting said separate fluorescent lights simultaneously with a corresponding plurality of sensors under a condition that each separate fluorescent light corresponds to one sensor, so as to catalog positions and intensities of detected fluorescent lights which are representative of a coupled state of the hybridized target DNA on said DNA chip.

9. EVIDENCE APPENDIX

Evidence submitted by Appellant and/or Examiner and entered within the record, along with a statement setting forth where in the record the evidence was entered in the record by the Examiner, is detailed as follows:

Pinkel et al. (U.S. Patent 5,830,645), Stern (U.S. Patent 5,981,956), and Rosenberg (U.S. Patent 4,538,613) were all first applied in a rejection within the 05 November 2003 Final Office Action.

Rava et al. (U.S. Patent 5,874,219) was first applied in a rejection within the 19 November 2004 Final Office Action.

Given that such are U.S. Patents and the USPTO has asked that copies of U.S. Patent not be submitted, copies of such references are not submitted herewith.

10. RELATED PROCEEDINGS APPENDIX

Copies of any papers and/or decisions entered/rendered by the Board or Court in any all other prior and pending appeals, interferences or judicial proceedings are detailed as follows:

None.

There are no prior or pending appeals, interferences or judicial proceedings, and accordingly, there are no papers and/or decisions.